2151

AIR QUALITY

NANTICOKE

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8/10/92

WORKING TOGETHER: THE NANTICOKE ENVIRONMENTAL COMMITTEE

ENVIRONMENT ONTARIO

ONTARIO HYDRO

STELCO INC.

ENVIRONMENT CANADA

IMPERIAL OIL

AIR QUALITY

NANTICOKE 1991

Working together: The Nanticoke Environmental Committee

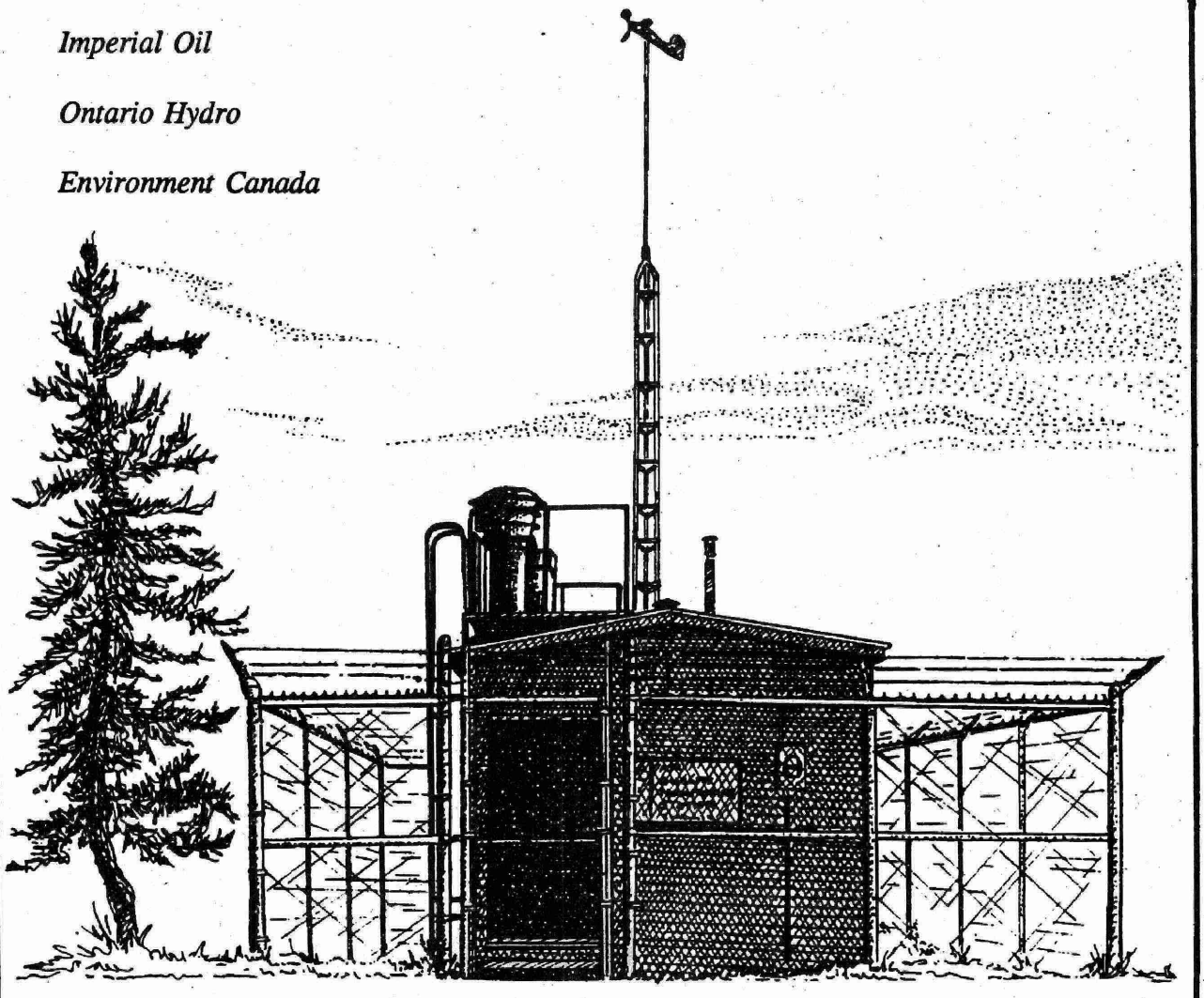
Ontario Ministry of Environment

Stelco Inc.

Imperial Oil

Ontario Hydro

Environment Canada



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1991 AIR QUALITY DATA SUMMARY
CITY OF NANTICOKE

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Air Quality Assessment
West Central Region
Ontario Ministry of the Environment

In cooperation with:

Stelco Inc.
Imperial Oil
Ontario Hydro, and
Environment Canada

OCTOBER 1992

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SUMMARY

Air monitoring in the industrial area of the City of Nanticoke showed that air quality was generally very good to excellent. Pollutants such as sulphur dioxide, nitrogen oxides, particulates and fluoride showed very low concentrations well below Ministry objectives. Two types of pollutants were measured at higher levels. These were:

1/ Sulphur odours near Stelco Steel in Nanticoke Village. These sometimes extended several kilometres beyond the Village and were the result primarily of slag quenching operations and coke oven related operations at Stelco. This situation is improving however and lower levels were apparent in the 1991 results. Further improvements have been achieved in 1992 following various abatement activities by the company.

2/ Ground level ozone concentrations arising from long range transport of precursor pollutants from the United States during the summer. These levels occur across Southern Ontario. Ozone is damaging both to agricultural crops and human health. To solve this problem, control programs are being implemented in both the U.S. and Canada to reduce industrial and automotive emissions. The programs have set a target year of 2005 by which time the ozone guidelines should be met.

The other two major industries in the area, Imperial Oil and Ontario Hydro's Nanticoke Generating Station showed mostly negligible ground level effects. Imperial Oil's only effect appeared to be infrequent sulphur odour emissions, while Ontario Hydro's main emission - sulphur dioxide, met all objectives out of over 80, 000 hours of monitoring.

INTRODUCTION

The Nanticoke Environmental Management Program (NEMP) was formed in 1978 to co-ordinate a study of the background air quality and subsequent impact of industrial development on air quality in the area surrounding Nanticoke. NEMP was sponsored jointly by the Federal and Ontario Governments, Ontario Hydro, Stelco and Texaco (now Imperial Oil). Beginning in 1984, the West Central Region of the Ontario Ministry of the Environment assumed responsibility for network operations from the Air Resources Branch. At that time, the monitoring network was reduced because air quality was generally good, and intensive monitoring in outlying areas was not warranted.

In mid - 1985, NEMP and a similar group concerned with water quality were amalgamated into one organization called the Nanticoke Environmental Committee. All activities are now undertaken under NEC. A private contractor funded by Imperial Oil and Stelco provided one technician to assist in maintaining the air monitoring network.

The purpose of the monitoring program is to determine compliance with provincial air quality criteria and also to measure the impact of the industrial development on the local air quality. Contaminants which may enter the area from outside sources are also identified.

The three main industries which have located in Nanticoke are Ontario Hydro's Thermal Generating Station, Imperial Oil's oil refinery (formerly Texaco) and Stelco's basic steel plant. A few smaller industries have located in the area as well.

NEC has undertaken to measure the ambient air concentrations of those compounds or substances that are regulated under the Provincial and Federal Environmental Protection Acts, and that could be a result of the Nanticoke industries' activities. The Ontario Ministry of the Environment's air quality criteria are set for the protection of human health and well being as well as to protect vegetation, animal life and property.

MONITORING NETWORK

Monitoring stations have been located to take into account predominant wind patterns and source locations as well as to try to differentiate between industrial and other contributions.

A map of the 1991 network is shown in Figure 1a with a closeup in Figure 1b, and the pollutants measured at each location are given in Table 1. Wind data (speed and direction) were measured at Long Point, near Jarvis and in Nanticoke Village. Figure 2 displays the wind frequency distribution measured at Nanticoke Village. Winds from the southwest sector tend to predominate. The Jarvis station's wind data were utilized in a computer program known as a "pollution rose" which is essentially a cross tabulation of average hourly pollutant concentrations with wind direction. The pollution roses for individual stations are illustrated graphically on maps in the report. For each "rose" presented, the length of individual lines drawn is proportional to the average concentration when the wind was blowing from that direction. This means that the longest lines tend to point to the pollution source.

In addition to the NEMP monitoring network, Ontario Hydro has operated its own network of sulphur dioxide analyzers since 1970. These data are also referred to in this report.

TABLE 1
MONITORING NETWORK

Map Ref.	Number	Location	SO_2	TSP	COH	TRS	O_3	NOx	DF	F	Wind/ Temp
1	22057	Nanticoke Creek								X	
2	22070	Nanticoke Village							X		
3	22071	Simcoe	X				X	X			
4	22074	Imperial Oil								X	
5	22086	Cheapside	X					X			
6	22090	Port Dover		X							
7	22092	Rainham/ Sandusk		X					X		
8	22093	N.G.S. Flyash Area							X		
9	22094	Townsend	X								
10	22901	Long Point	X				X	X			X

SO_2 - sulphur dioxide
TSP - total suspended particulates
COH - soiling index
TRS - total reduced sulphur
O_3 - ozone
NOx - oxides of nitrogen
DF - dustfall
F - fluoride

TABLE 1 (Continued)
MONITORING NETWORK

Map Ref.	Number	Location	SO_2	TSP	COH	TRS	O_3	NOx	DF	F	Wind/ Temp
11	22904	S. Walpole School	X(O.H)	X		X					
12	22907	Nanticoke Village	X	X	X	X					
13	22961	Nanticoke North		X						X	
14	22964	Stelco North		X							
15	22883	Jarvis Met Tower (Ontario Hydro)									X
16	22911	Balmoral (Ontario Hydro)	X								
17	22913	Nanticoke Road (Ontario Hydro)	X								
18	22914	Sandusk (Ontario Hydro)	X								
19	22915	Kohler (Ontario Hydro)	X								

SO_2 - sulphur dioxide
TSP - total suspended particulates
COH - soiling index
TRS - total reduced sulphur
O_3 - ozone
NOx - oxides of nitrogen
DF - dustfall
F - fluoride
O.H - Ontario Hydro monitor (SO_2)

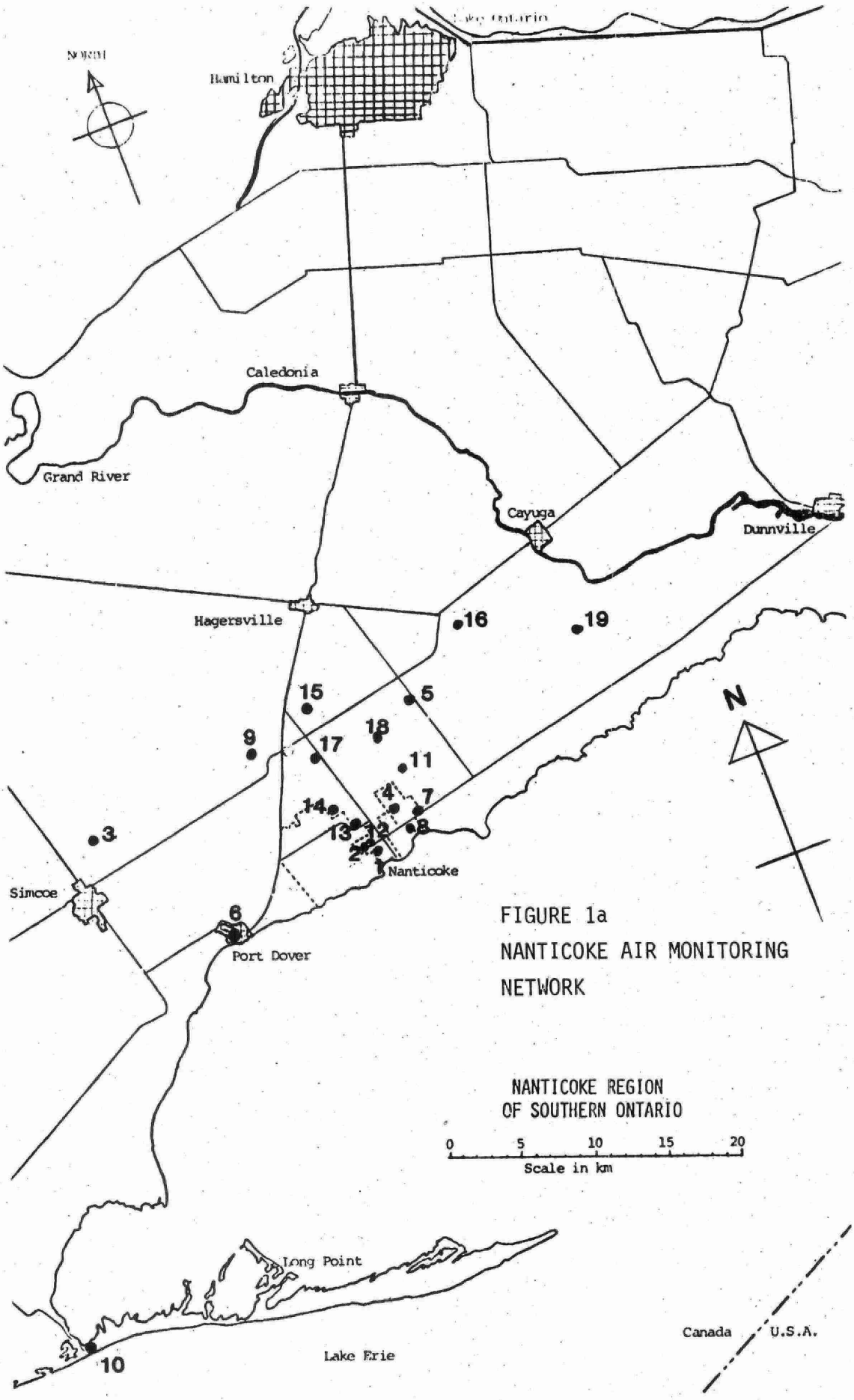


FIGURE 1a
NANTICOKE AIR MONITORING
NETWORK

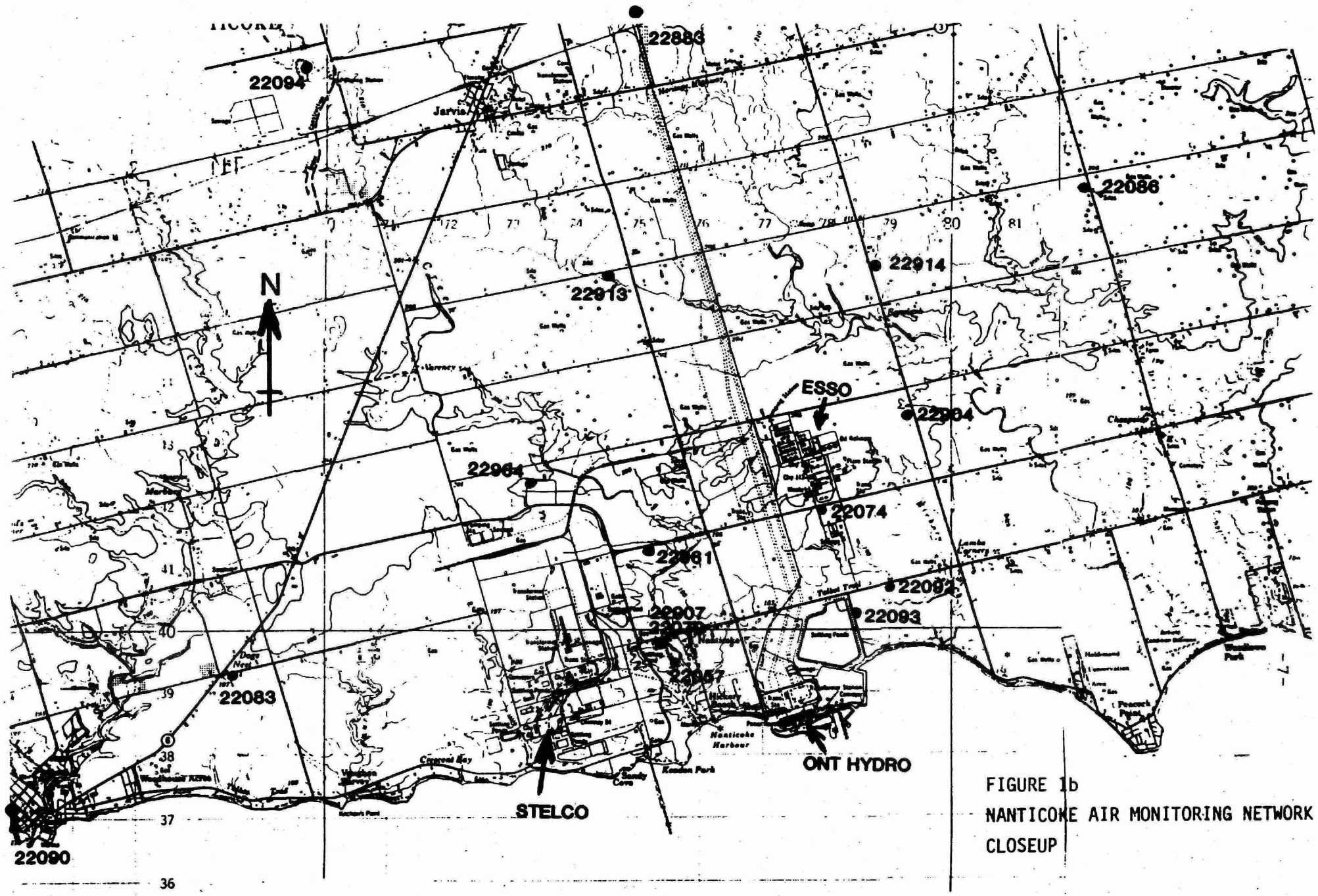


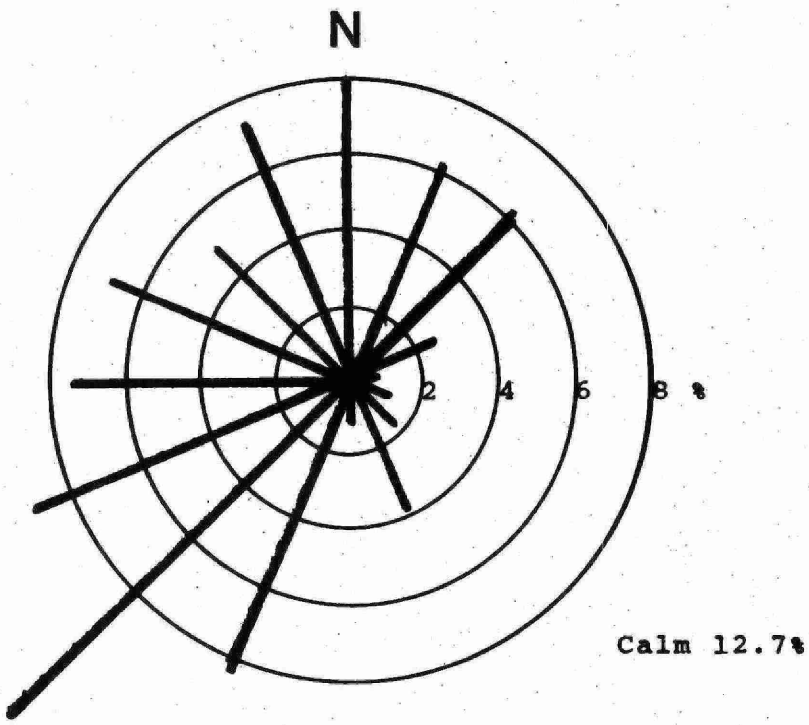
FIGURE 1b
NANTICOKE AIR MONITORING NETWORK
CLOSEUP

FIGURE 2

WIND FREQUENCY DISTRIBUTION

22907 - NANTICOKE VILLAGE

1991



Lines indicate direction from which wind blew.

ANALYSIS OF DATA

Sulphur Dioxide

Sulphur dioxide (SO_2) was measured continuously at five sites within the NEC network and at five Ontario Hydro stations in 1990. All of the stations easily met the annual and daily air quality objectives of .02 and .10 ppm respectively and, the hourly standard of .25 ppm was not exceeded at any station out of about 80,000 hours of monitoring. Data from the Ministry monitors are given in Table 2a and data for the Hydro monitors are in Table 2b.

Figure 3 illustrates the historical trend of sulphur dioxide annual average concentrations of six SO_2 monitors which have operated continuously since 1976. A modest decline in concentrations can be seen over this period. Similarly in Figure 4, the number of hourly exceedences per year at these six stations is shown. A declining trend is apparent in this graph as well.

TABLE 2a
SULPHUR DIOXIDE
UNITS - PARTS PER MILLION
MINISTRY OF THE ENVIRONMENT MONITORS

Ontario Objectives: 1-hour - .25
24-hour - .10
1-year - .02

		Annual Average	Maximum 1-hour	Maximum 24-hour	# of Times > Objective 1-hour	# of Times > Objective 24-hour
22071 Simcoe	1991	.003	.10	.02	0	0
	1990	.004	.09	.02	0	0
	1989	.005	.14	.02	0	0
	1988	.005	.29	.04	1	0
22086 Cheapside	1991	.005	.13	.03	0	0
	1990	.006	.15	.03	0	0
	1989	.007	.25	.05	0	0
	1988	.006	.36	.04	1	0
22094 Townsend	1991	.004	.13	.02	0	0
	1990	.003	.13	.02	0	0
	1989	.003	.17	.02	0	0
	1988	.002	.21	.02	0	0
22901 Long Point	1991	.004	.06	.02	0	0
	1990	.004	.10	.02	0	0
	1989	.004	.16	.03	0	0
	1988	.002	.10	.02	0	0
22907 Nanticoke Village	1991	.006	.05	.04	0	0
	1990	.008	.23	.05	0	0
	1989	.007	.16	.04	0	0
	1988	.004	.15	.05	0	0

TABLE 2b
SULPHUR DIOXIDE
UNITS - PARTS PER MILLION
ONTARIO HYDRO MONITORS

Ontario Objectives: 1-hour - .25
24-hour - .10
1-year - .02

		Annual Average	Maximum 1-hour	# of Times > Objective 1-hour	24-hour
22911 Balmoral	1991	.004	.19	0	0
(NNE16)	1990	.004	.14	0	0
	1989	.005	.32	1	0
	1988	.004	.22	0	0
22913 Nanticoke Rd.	1991	.003	.20	0	0
(NNW08)	1990	.003	.20	0	0
	1989	.004	.20	0	0
	1988	.003	.18	0	0
22914 Sandusk	1991	.004	.14	0	0
(NO7)	1990	.004	.09	0	0
	1989	.005	.29	2	0
	1988	.004	.22	0	0
22915 Kohler	1991	.003	.09	0	0
(NE19)	1990	.003	.12	0	0
	1989	.004	.18	0	0
	1988	.003	.13	0	0
22916 Walpole South	1991	.005	.15	0	0
School	1990	.005	.23	0	0
	1989	.006	.20	0	0
(NNE05)	1988	.005	.30	2	0

SULPHUR DIOXIDE TREND

NANTICOKE 6 station average

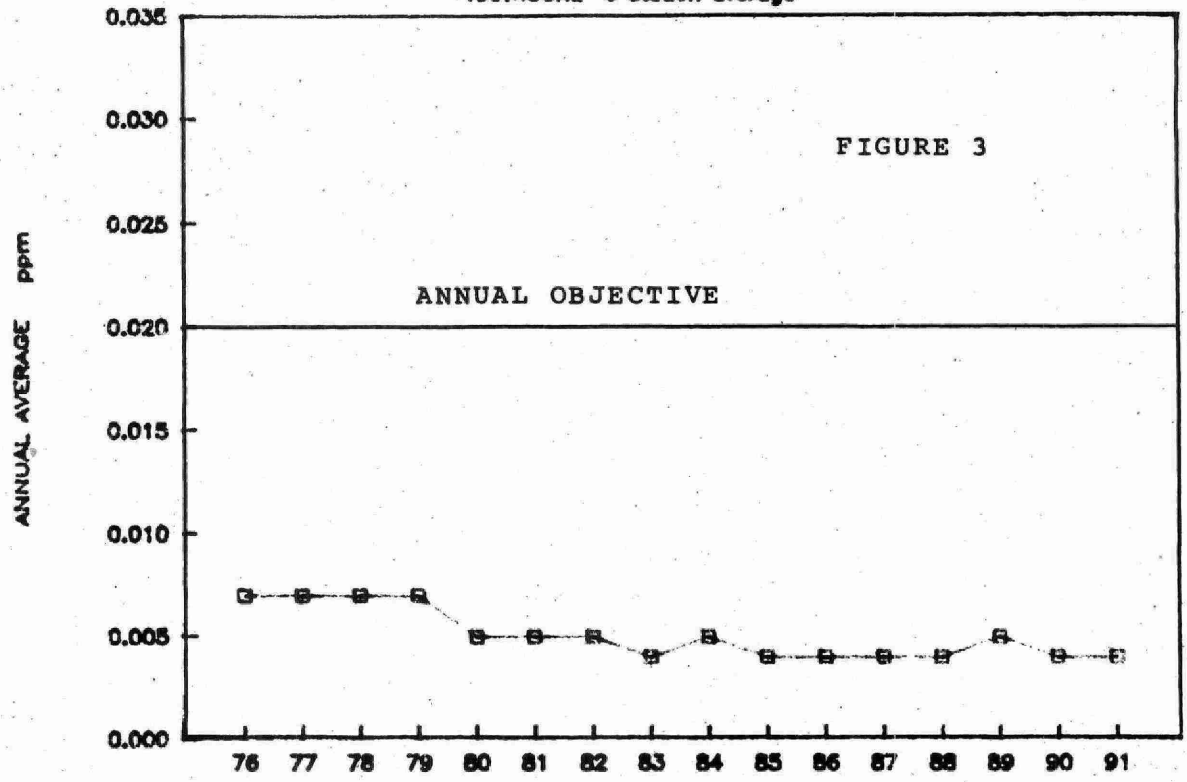


FIGURE 3

SULPHUR DIOXIDE EXCEEDANCE TREND

HOURS OVER .25 ppm/NANTICOKE 6 stations

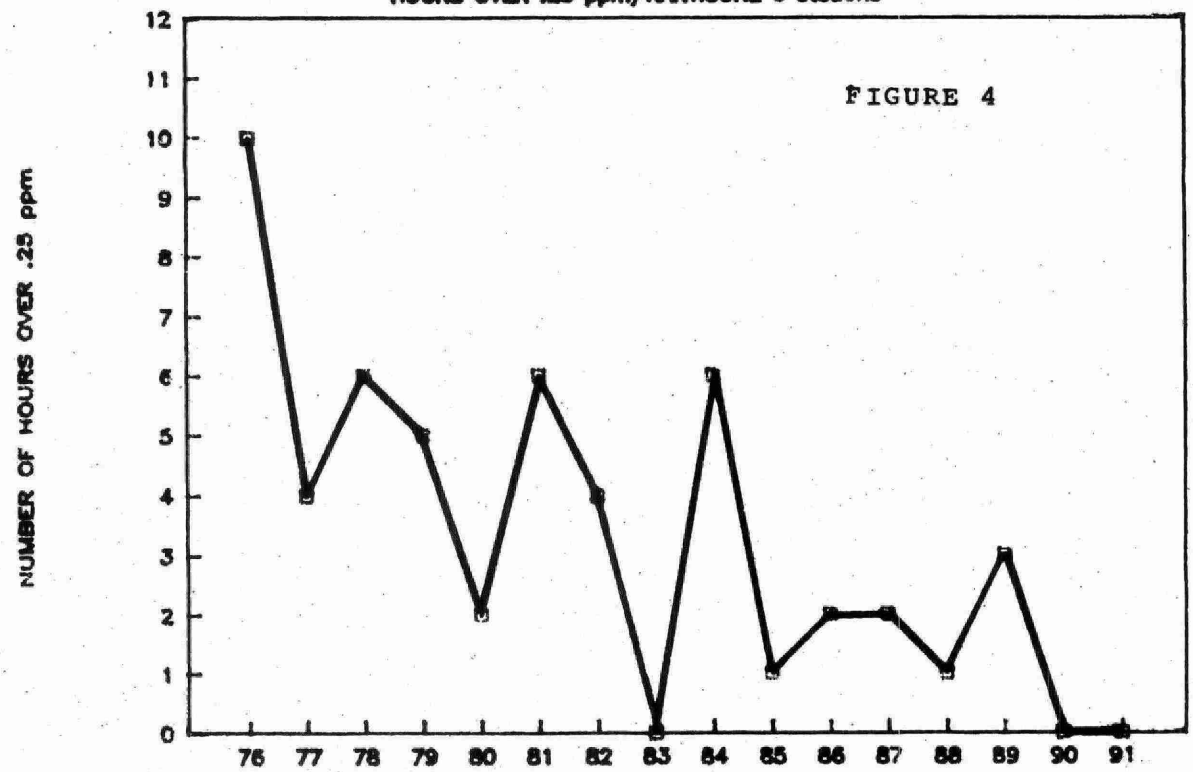


FIGURE 4

Total Reduced Sulphur

Total Reduced Sulphur (TRS) was monitored at two locations - in Nanticoke Village and at South Walpole School on Sandusk Road. A TRS analyzer located at 22086 Cheapside Road just south of Highway 3 was terminated early in 1991 due to continual low readings. There are no general criteria for TRS but there is an hourly objective for hydrogen sulphide (H_2S), the "rotten egg" gas, of 20 ppb. The monitoring instrument measures H_2S, and other sulphur compounds.

Sources of these pollutants include slag quenching activities and the coke ovens/by-products plant at Stelco and fuel oil storage tanks and a sulphur recovery operation at Esso. Apart from industrial sources, sulphur compounds can be liberated from groundwaters that have been contaminated by natural seepages or from leaking natural gas wells, known to exist in the area. Stelco sulphide emissions have been shown to consist primarily of H_2S and thus, comparison of TRS data to the H_2S objective, particularly within Nanticoke Village when downwind of Stelco, is reasonable. Imperial Oil emissions have been less well characterized but are not believed to consist primarily of H_2S. Other organic sulphur compounds are probably present in their emissions and consequently levels downwind of this refinery cannot always be compared to the H_2S standard. The TRS data are summarized in Table 3.

In 1991, TRS levels remained low at the South Walpole School station. Nanticoke Village showed higher levels than the school. Yearly trends are illustrated in Figure 5. These data indicate the number of hours exceeding 10 ppb which is the approximate odour threshold for H_2S and a level the Ministry is aiming to reset the criterion at.

The South Walpole School station did not exceed the criterion level of 20 ppb but did record 15 hours above the odour threshold of 10 ppb in 1991, as given in Table 3, similar to previous years. Most of these concentrations coincided with equally high or higher levels measured at the Nanticoke Village Station. This, together with the southwest wind conditions, implies that Stelco, not Imperial Oil, may have been the

source of some of these elevated levels measured at the school. Imperial Oil did appear to have been the source of the elevated readings on two occasions (6 hours).

Levels recorded in Nanticoke Village close to Stelco were much improved from 1990. There were 6 hours above the hourly H_2S objective (20 ppb) during the year, down from 20 in 1990 and 90 hours above the odour threshold level of 10 ppb, down from 172 in 1990.

Stelco was on strike from August 1st to mid-November 1990 and this seemed to have a significant impact on TRS levels at 22907 as given in Figure 6, a month by month trend graph for 1990 as well as the prior 2 years and 1991. Levels decreased during the strike months in 1990, however, this decline at that time of year was common to all other prior years. In 1991, Stelco undertook revised procedures at their blast furnace slag pits, reducing the frequency of slag quenching. Improvements from June 1991 to the present are apparent in the data. Of the 90 hours over 10 ppb, 62 occurred during January - May when the revised procedures had not yet been implemented. Levels were particularly elevated in April due to technical problems at the slag pit and the coke oven flare stack. These problems were rectified.

The pollution rose in Figure 7 for Nanticoke Village 22907 shows a very strong TRS impact from Stelco. The rose for the school site 22904 shows lesser impact.

As shown in Figure 5, higher TRS concentrations in Nanticoke Village are plainly evident since 1982. Discussions with Stelco have been undertaken in order to identify and reduce TRS emissions. Past data have suggested that slag quenching is the main source affecting TRS levels, however, there is one other potential source of TRS at Stelco - the coke ovens/by-products plant. A special survey with a fixed TRS sampler between the two sources on Stelco property was run in 1988. It showed that both sources were capable of discharging very odorous TRS concentrations. During the 1990 strike, the coke oven operation continued while slag quenching ceased and occasional elevated levels

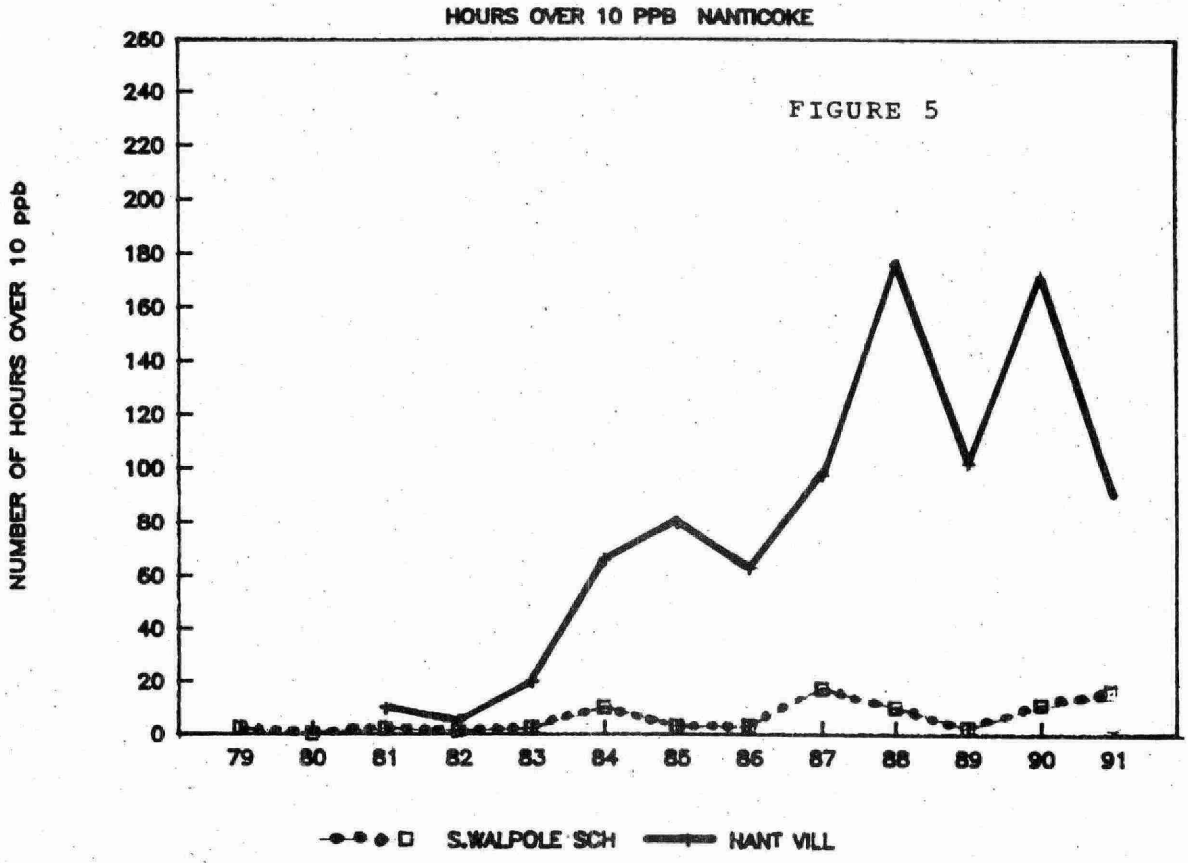
were measured in the Village, indicating the coke oven/byproduct area does have some effect. As mentioned, Stelco has been implementing an Action Plan to address their TRS emissions generated at the slag quenching pits. Stelco is also installing a control system at the coke oven tar decanters in mid-1992 to eliminate hydrocarbon odours from that source.

TABLE 3
TOTAL REDUCED SULPHUR
UNITS - PARTS PER BILLION

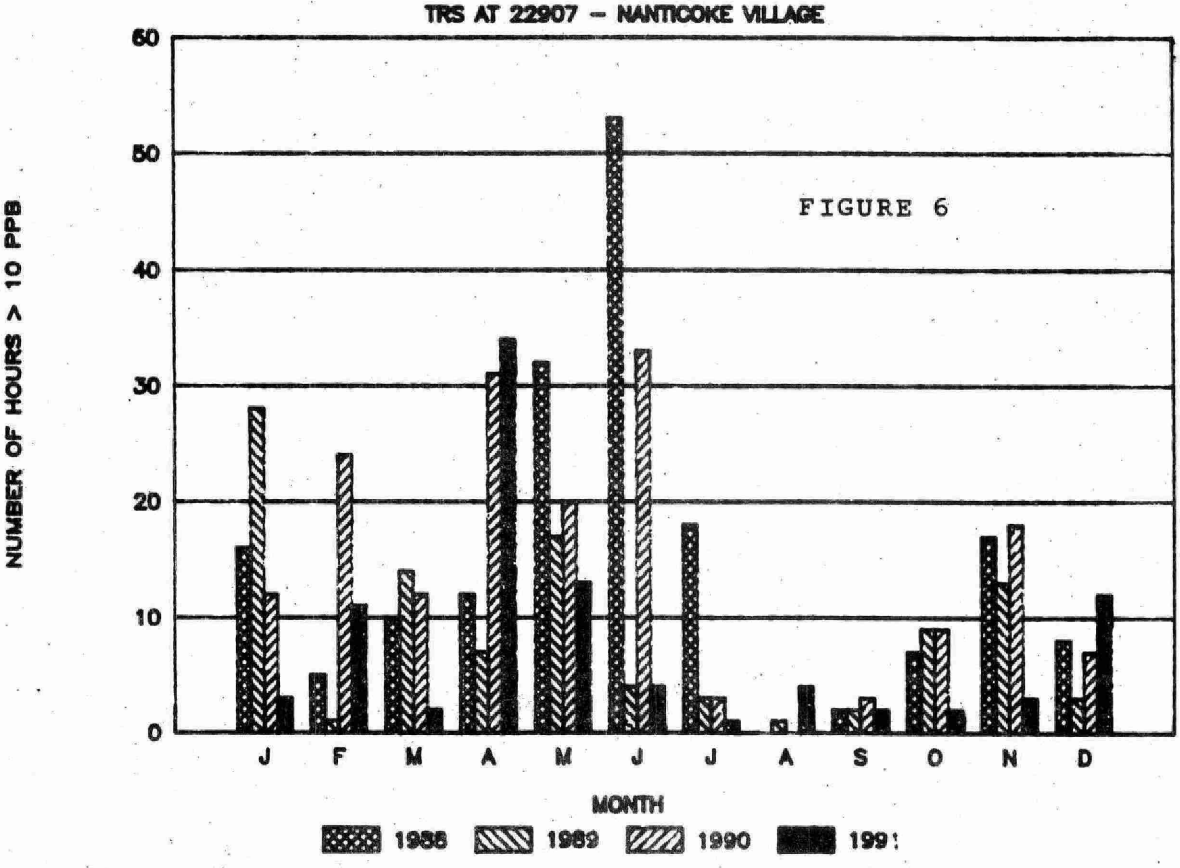
Ontario Objectives: 1-hour - 20
(Hydrogen sulphide)

		Annual Average	Maximum 1-hour	# of Hours Above 20 ppb	# of Hours Above 10 ppb
22904 South Walpole School	1991	.7	20	0	15
	1990	.7	20	0	11
	1989	.7	12	0	2
	1988	.4	22	1	10
22907 Nanticoke Village	1991	1.1	30	6	90
	1990	1.4	82	20	172
	1989	1.2	141	12	102
	1988	1.3	98	28	176

TOTAL REDUCED SULPHUR EXCEEDANCE TREND



HOURLY FREQUENCIES OVER ODOUR THRESHOLD



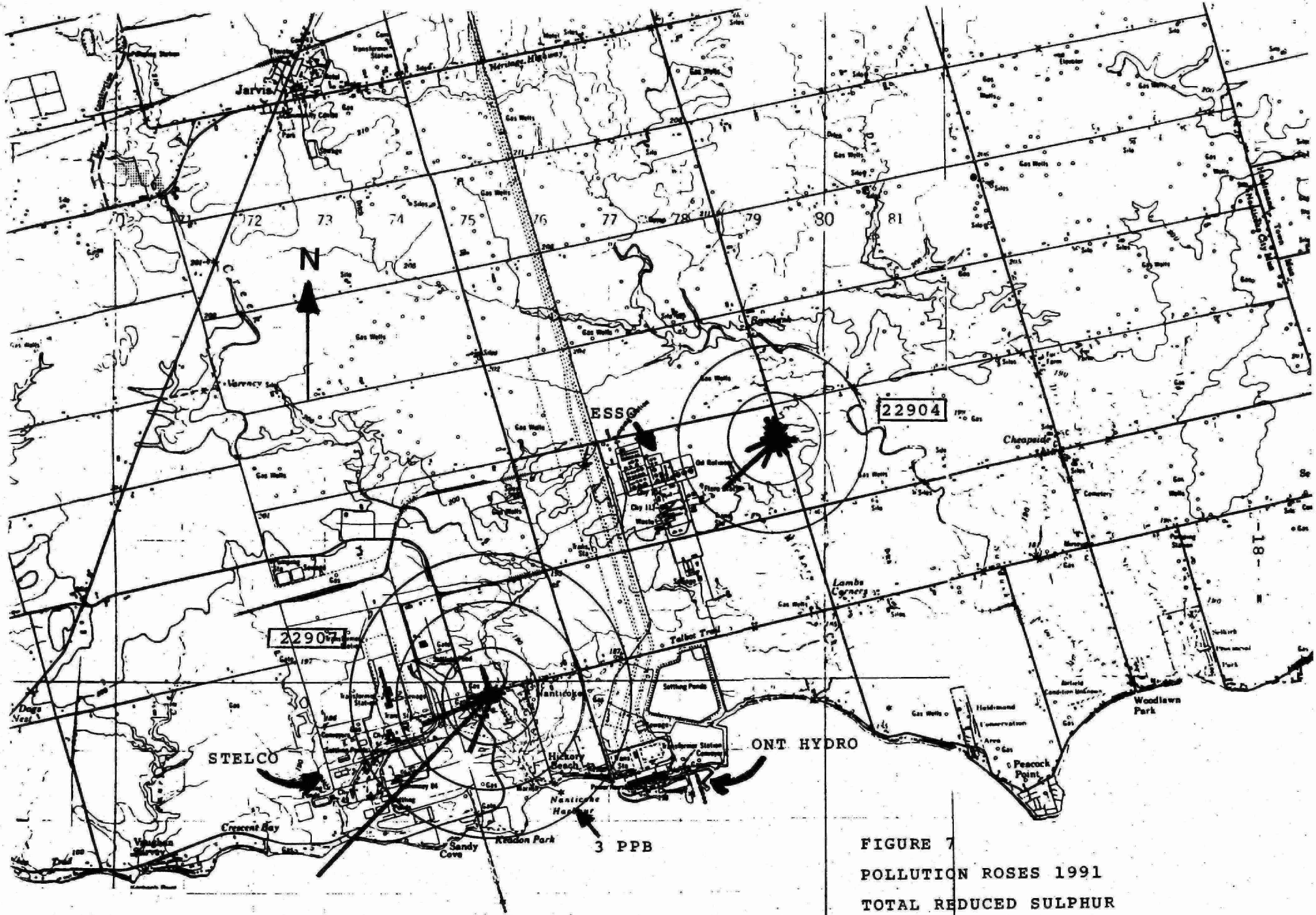


FIGURE 7

POLLUTION ROSES 1991

TOTAL REDUCED SULPHUR

Oxides of Nitrogen

Oxides of nitrogen result from high temperature combustion sources including automobiles and industrial facilities. The most abundant oxides are nitric oxide (NO) which is largely a direct emission of fuel burning and nitrogen dioxide (NO_2) which is mostly an oxidation product once the contaminant is airborne. Objectives exist only for nitrogen dioxide and are based on odour threshold levels (hourly - .2 ppm) and health effects (24-hour - .1 ppm). Other adverse effects occurring at higher levels include vegetation damage, reduced visibility and corrosion of metals.

Data for NO_2 and NO for three stations are summarized in Tables 4 and 5. Levels in 1991 continued to be very low and well within objectives. There have never been any NO_2 exceedences measured. The concentrations at the three stations are similar to each other and thus tend to represent background levels.

Yearly trends of NO_2 for the three stations are given in Figure 8. Overall, a trend to decreasing concentrations is apparent. Data in Table 5 show an increase in the NO averages in 1991. The reason for this is unclear, except that variations in long-term averages of low level concentrations may be simply due to statistical randomness. Figure 9 depicts annual NO trends for the three stations and displays unstable averages exhibiting no real trend. Instrument performance at low concentrations may be a factor in the instability.

TABLE 4
NITROGEN DIOXIDE
UNITS - PARTS PER MILLION

Ontario Objectives: 1-hour - .20
24-hour - .10

		Annual Average	Maximum 1-hour	Maximum 24-hour	# of Times > Objective 1-hour	# of Times > Objective 24-hour
22071 Simcoe	1991	.007	.04	.03	0	0
	1990	.005	.05	.02	0	0
	1989	.010	.06	.03	0	0
	1988	.008	.06	.03	0	0
22086 Cheapside	1991	.005	.05	.02	0	0
	1990	.009	.04	.02	0	0
	1989	.010	.05	.03	0	0
	1988	.007	.07	.03	0	0
22901 Long Point	1991	.006	.08	.02	0	0
	1990	.008	.06	.03	0	0
	1989	.007	.05	.03	0	0
	1988	.011	.05	.04	0	0

TABLE 5
NITRIC OXIDE
UNITS - PARTS PER MILLION

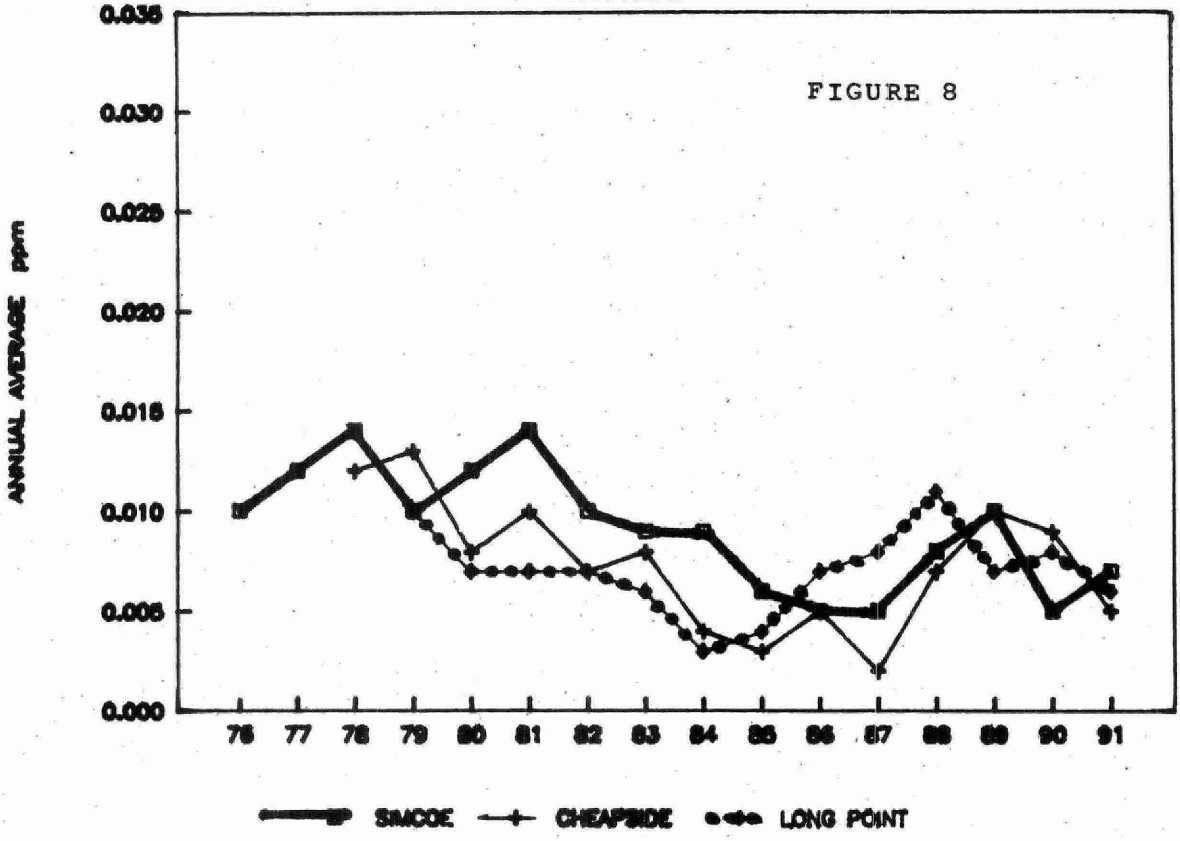
No MOE Objective

		Annual Average	Maximum 1-hour	Maximum 24-hour
22071 Simcoe	1991	.002	.08	.02
	1990	.001	.09	.01
	1989	.001	.09	.02
	1988	.002	.08	.02
22086 Cheapside	1991	.005	.11	.03
	1990	.001	.11	.02
	1989	.002	.13	.03
	1988	.003	.21	.03
22901 Long Point	1991	.006	.06	.02
	1990	.001	.04	.01
	1989	.001	.07	.05
	1988	.001	.07	.04

NITROGEN DIOXIDE TREND

NANTICOKE

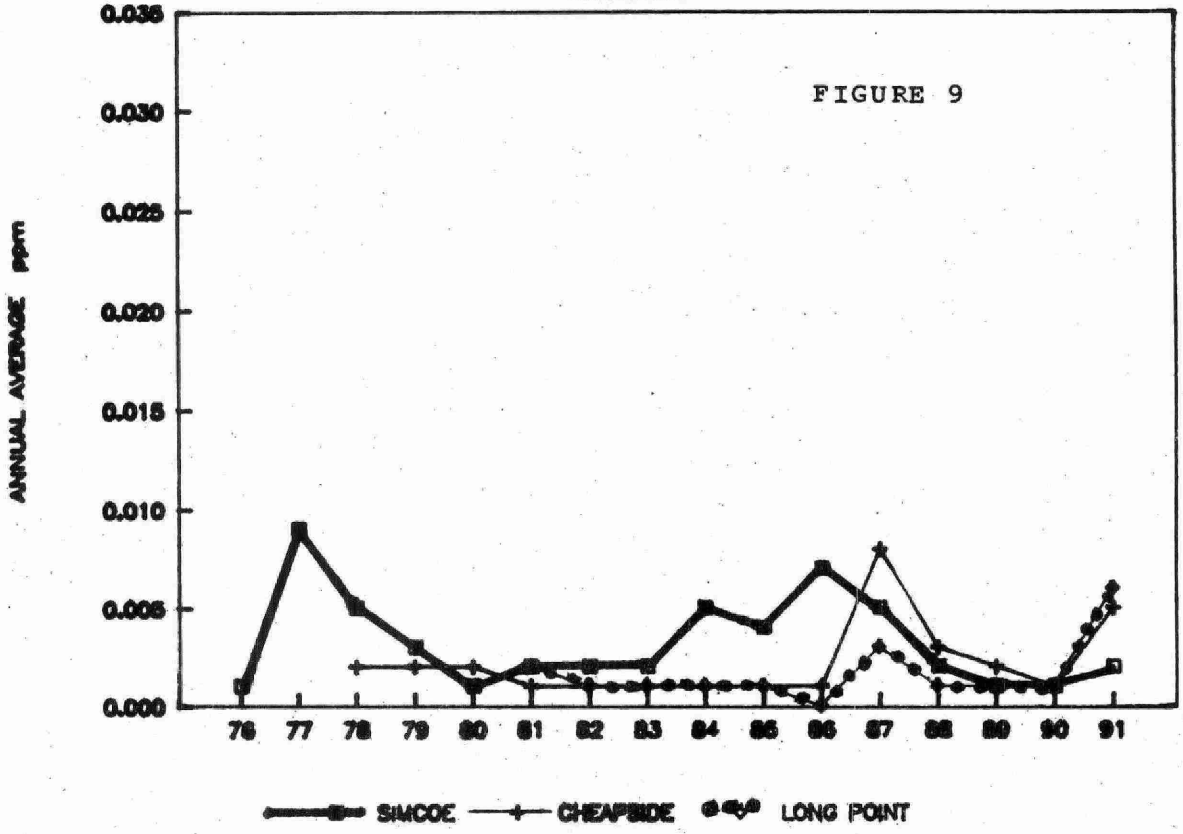
FIGURE 8



NITRIC OXIDE TREND

NANTICOKE

FIGURE 9



Soiling Index (Coefficient of Haze)

Coefficient of haze tape samplers operate continuously and determine hourly soiling values of dust in air. Air is drawn through a filter paper trapping dust on the filter, and the optical density of the darkened spot is measured by light transmittance. The instrument takes readings before and after sample collection. The resultant light obstruction is determined and converted to a unit known as coefficient of haze. The particles sampled are very small, less that 10 microns in diameter (a micron is a millionth of a metre) and thus represent the respirable range.

A tape sampler was installed in 22907 - Nanticoke Village in late 1988. The 1991 data are summarized in Table 6. The yearly average was less than half the yearly objective and the daily objective was not exceeded. Concentrations over the three years of sampling have been stable.

TABLE 6
SOILING INDEX
UNITS - COH'S/1000 FT.

Ontario Objectives: 24-hour - 1.0
1-year - 0.5

		Annual Average	Maximum 24-hour	# of times > 24-hour Objective
22907 Nanticoke Village	1991	.24	0.7	0
	1990	.22	0.8	0
	1989	.25	0.8	0

Ozone

Oxidants are products of photochemical reactions involving oxides of nitrogen, hydrocarbons and sunlight. The nitrogen oxides and hydrocarbons come mainly from cars and industry. Ozone (O_3) is the main oxidant chemical produced. Ozone damages vegetation including tobacco and tomato crops. The 1-hour objective for ozone (.08 ppm) is based on vegetation effects, but ozone is also a respiratory irritant and can have adverse human health effects at more concentrated levels.

Concern is often expressed about loss of ozone in the stratosphere. Although unwanted at ground level, ozone plays an important role in the upper atmosphere, where it absorbs ultraviolet light from the sun. Loss of this upper level ozone is indeed an ongoing concern but is not the focus of this report.

Ground level ozone concentrations follow very definite annual and daily trends. Highest levels occur during the summer (May to September), and the daily maxima usually occur during mid-afternoon. Both patterns occur because ozone production increases with temperature and sunlight.

Ozone concentrations were measured at two sites and data are summarized in Table 7. In 1991, ozone levels again frequently exceeded the hourly objective in the summer as in previous years. There were 218 exceedences of the objective observed at Long Point and 63 at Simcoe. Elevated levels generally occurred at the same time at both stations during the summer with slightly higher concentrations measured at Long Point during southerly winds indicating that the high concentrations were imported from the United States.

The yearly trend graph of hourly exceedences at the two stations in Figure 10 indicates random fluctuations which are probably related to climatological variation. The year 1988 was particularly bad for ozone.

Ozone, hydrocarbons and oxides of nitrogen can be transported over great distances and can be augmented by local sources. It is generally

believed that the ozone problem in Southern Ontario has a large component due to long range transport from the United States and thus will have to be resolved on an international and national rather than local scale.

In recognition of the seriousness of the ground-level ozone problem, the Canadian Council of Ministers of the Environment decided in 1988 to develop a management plan for he control of nitrogen oxides (NOx) and volatile organic compounds (VOC). A three phase NOx and VOC control plan was developed to resolve the ozone problem by the year 2005. This program is being undertaken in concert with the United States which plans similar strategies.

TABLE 7
OZONE
UNITS - PARTS PER MILLION

Ontario Objectives: 1-hour - .08

		Annual Average	Maximum 1-hour	# of Hours Above Objective
22071 Simcoe	1991	.029	.104	63
	1990	.026	.111	49
	1989	.029	.093	42
	1988	.031	.190	354
22901 Long Point	1991	.034	.128	218
	1990	.033	.130	168
	1989	.036	.135	257
	1988	.038	.189	566

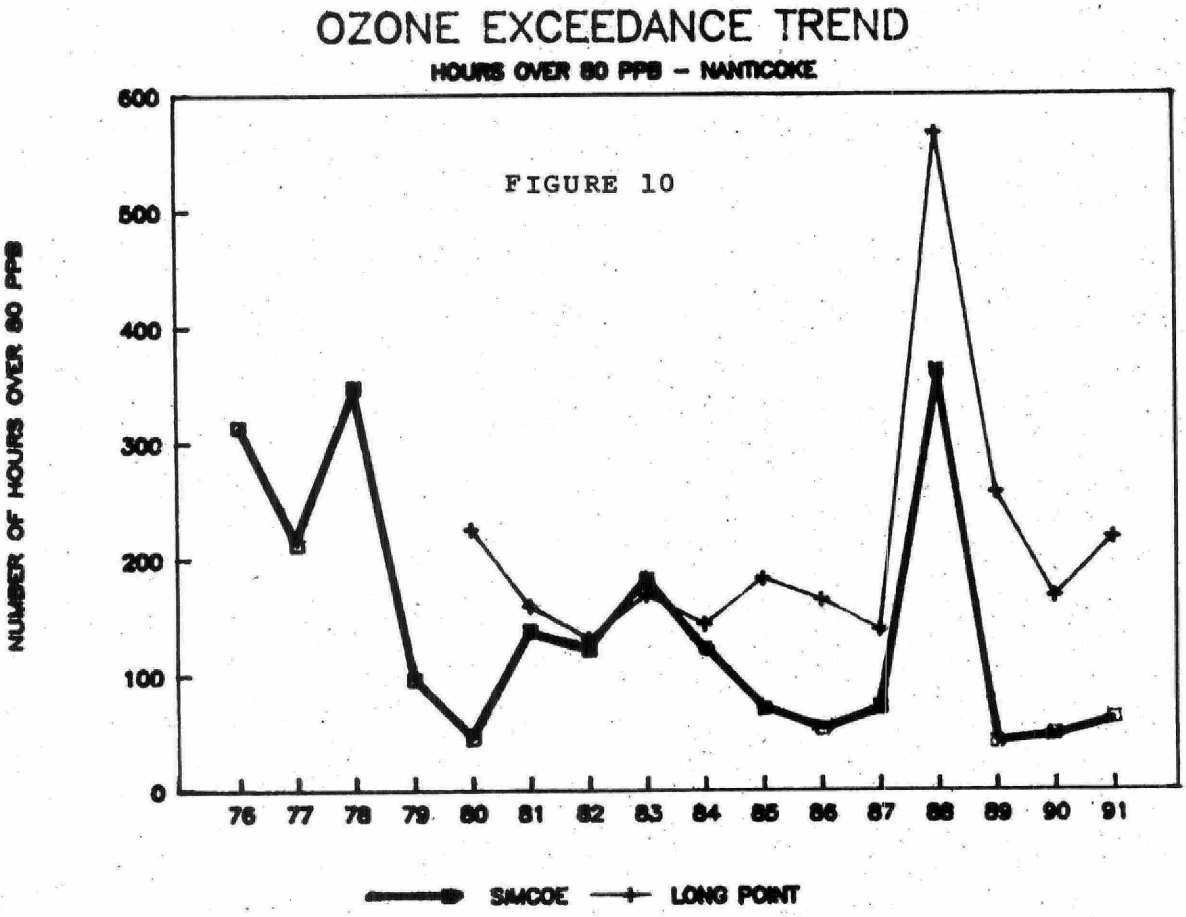

OZONE EXCEEDANCE TREND
HOURS OVER 80 PPB - NANTICOKE
NUMBER OF HOURS OVER 80 PPB
600
500
400
300
200
100
0
76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91
SIMCOE
LONG POINT

FIGURE 10

Total Suspended Particulates

Total suspended particulates (TSP) in air are measured with high volume samplers which draw a known volume of air through a pre-weighed filter for a 24 hour period (midnight to midnight). The exposed filter is weighed, and the difference (weight of solids on filter) in conjunction with the known air volume sampled is used to calculate a TSP concentration in micrograms per cubic meter. The objective for a 24 hour average is 120 ug/m^3 while the yearly geometric mean objective is 60 ug/m^3. The samplers operate once every six days.

Data from total suspended particulate measurements at six locations are summarized in Table 8. The daily objective of 120 ug/m^3 was exceeded at three locations, one near Ontario Hydro and at two sites near Stelco. The yearly objective of 60 ug/m^3 was met at all stations.

The Hydro station (22092) measured one daily objective exceedence in July on a very windy day. Fugitive dust from Hydro property was the likely source. The station in Nanticoke Village (22907) measured four exceedences, all concentrated in May, likely due to emissions from Stelco property. The exact cause of the problems is unknown. The station known as Nanticoke North (22961) measured one elevated reading on one of the same days as Nanticoke Village.

Suspended particulates at 22092-Rainham/Sandusk near the Ontario Hydro Generating Station, remained low and within objectives with the one exception noted above. Measures to reduce windblown dust emissions at Ontario Hydro started in 1985 and continued into 1991. The control program has been successful as shown by the trend graph in Figure 11. It involved the recontouring of storage piles at Hydro's flyash disposal site and coal fields. Improved dust suppression equipment and materials were also implemented.

A total of six hi - vol stations have been operating continuously since 1984 in the Nanticoke area, and the combined yearly trend of these stations is shown in Figure 12. Low, stable levels are evident.

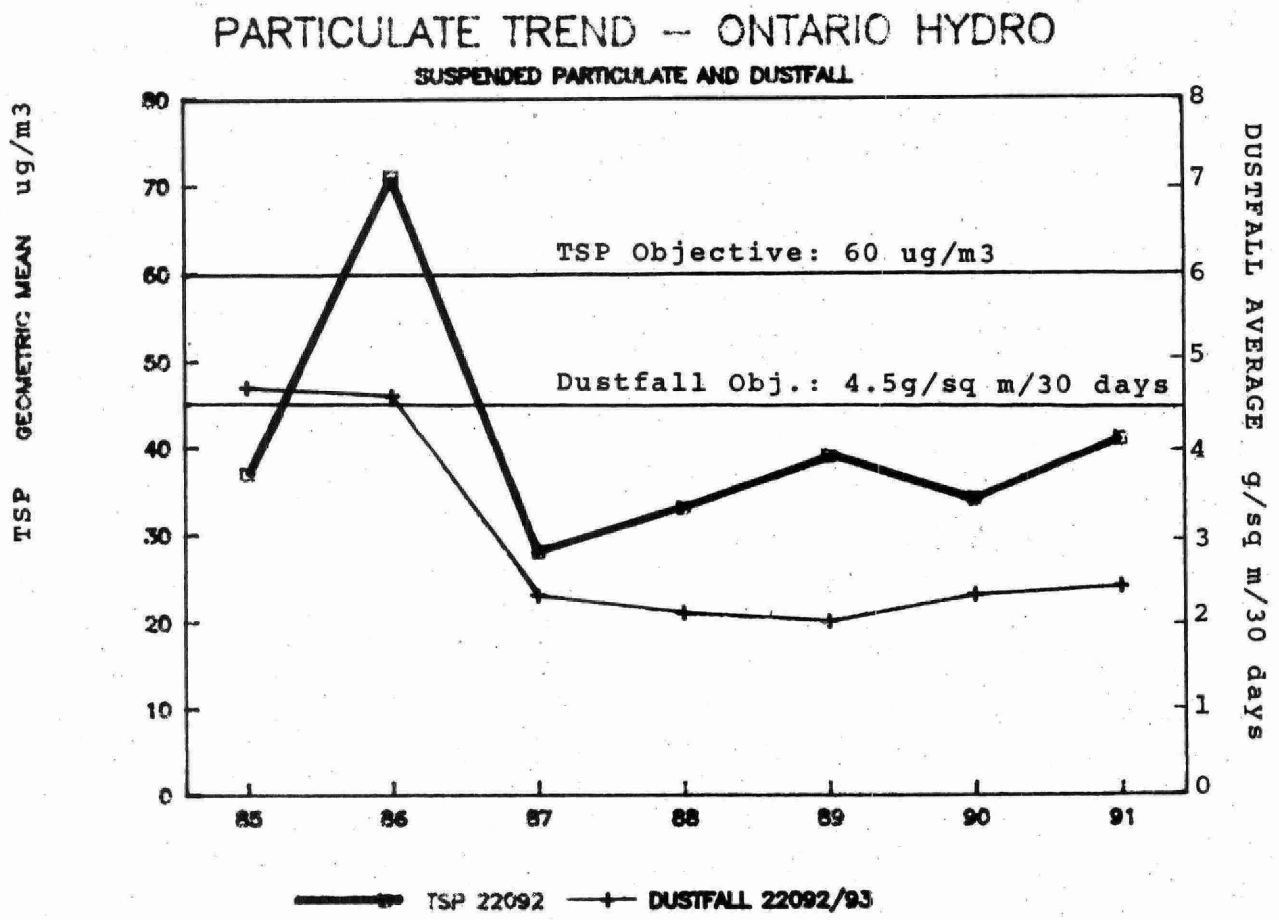
However, levels within Nanticoke Village, close to Stelco operations and to a lesser degree, near Ontario Hydro, remain a local concern and trends will be carefully monitored to ensure that particulate levels remain at acceptable levels.

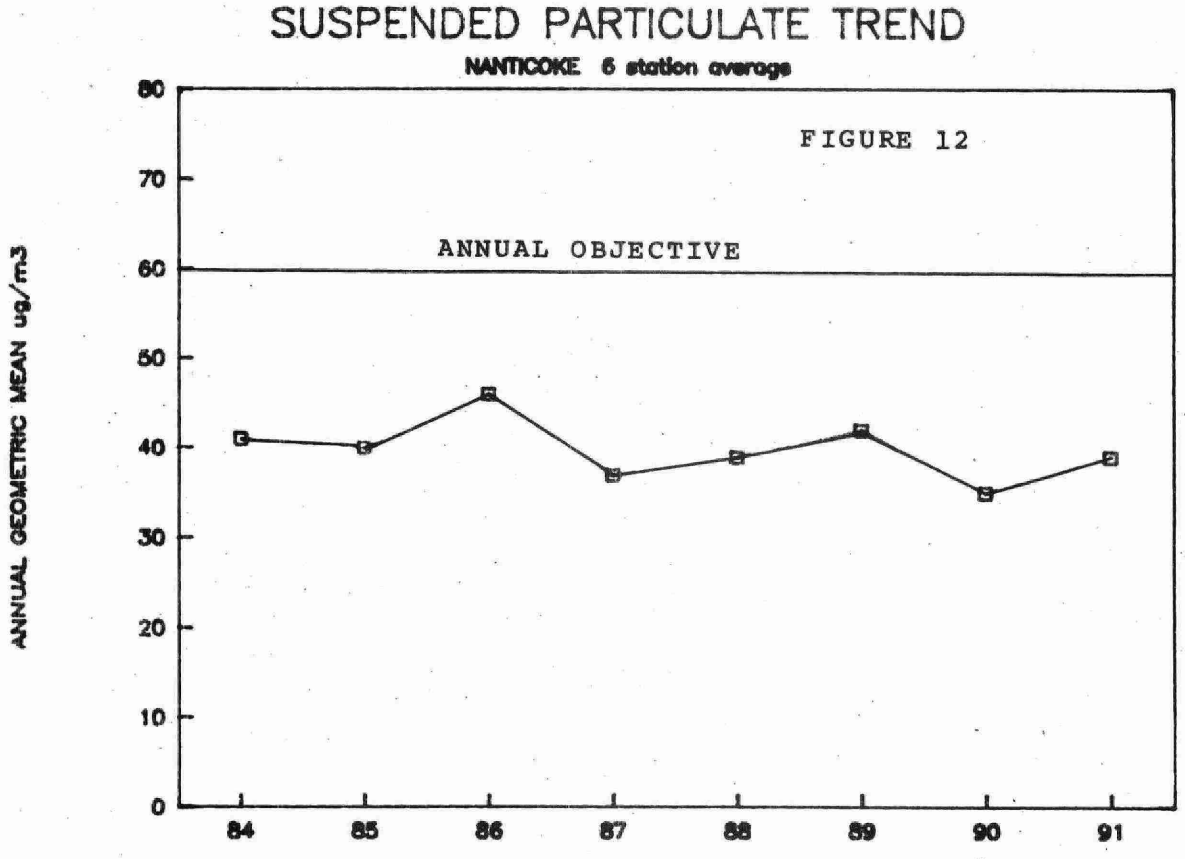
TABLE 8
SUSPENDED PARTICULATES
UNITS - MICROGRAMS PER CUBIC METER

Ontario Objectives: 24-hour - 120
1-year geometric mean - 60

		Geometric Mean			Maximum	% of Samples
		1989	1990	1991	1991	> 120 (1991)
22090	Port Dover	39	33	35	86	0
22092	Rainham/Sandusk	39	34	41	131	2
22904	South Walpole School	36	27	32	82	0
22907	Nanticoke Village	53	47	52	197	7
22961	Nanticoke North	42	35	40	122	2
22964	Stelco North	42	30	32	88	0

FIGURE 11


PARTICULATE TREND – ONTARIO HYDRO
SUSPENDED PARTICULATE AND DUSTFALL
TSP GEOMETRIC MEAN ug/m3
DUSTFALL AVERAGE g/sq m/30 days
TSP Objective: 60 ug/m3
Dustfall Obj.: 4.5g/sq m/30 days
0
10
20
30
40
50
60
70
80
1
2
3
4
5
6
7
8
85
86
87
88
89
90
91
TSP 22092
DUSTFALL 22092/93


SUSPENDED PARTICULATE TREND
NANTICOKE 6 station average
FIGURE 12
ANNUAL OBJECTIVE
ANNUAL GEOMETRIC MEAN ug/m3
80
70
60
50
40
30
20
10
0
84
85
86
87
88
89
90
91

Dustfall

Dustfall is that material which settles out of the atmosphere by gravity. It is collected in plastic containers during a 30 day exposure time. The collected material is weighed and expressed as a deposition rate of grams/m^2/30 days. The measurement is imprecise and effects are restricted to relatively local areas, however, it is the best method for measuring this heavy material. Dustfall objectives are based on nuisance effects and are 7.0 grams/m^2/30 days (monthly) and 4.5 grams/m^2/30 days (yearly average). Since dustfall is comprised solely of non-inhalable large particles it is not a health related parameter.

Dustfall was measured within Nanticoke Village in 1991, (station 22070) and data are given in Table 9. As in previous years, concentrations were low and below the monthly objective in all samples.

The annual trend at this station since 1975 is given in Figure 13. An increase occurred in 1984, and concentrations have since held relatively steady, below the yearly objective.

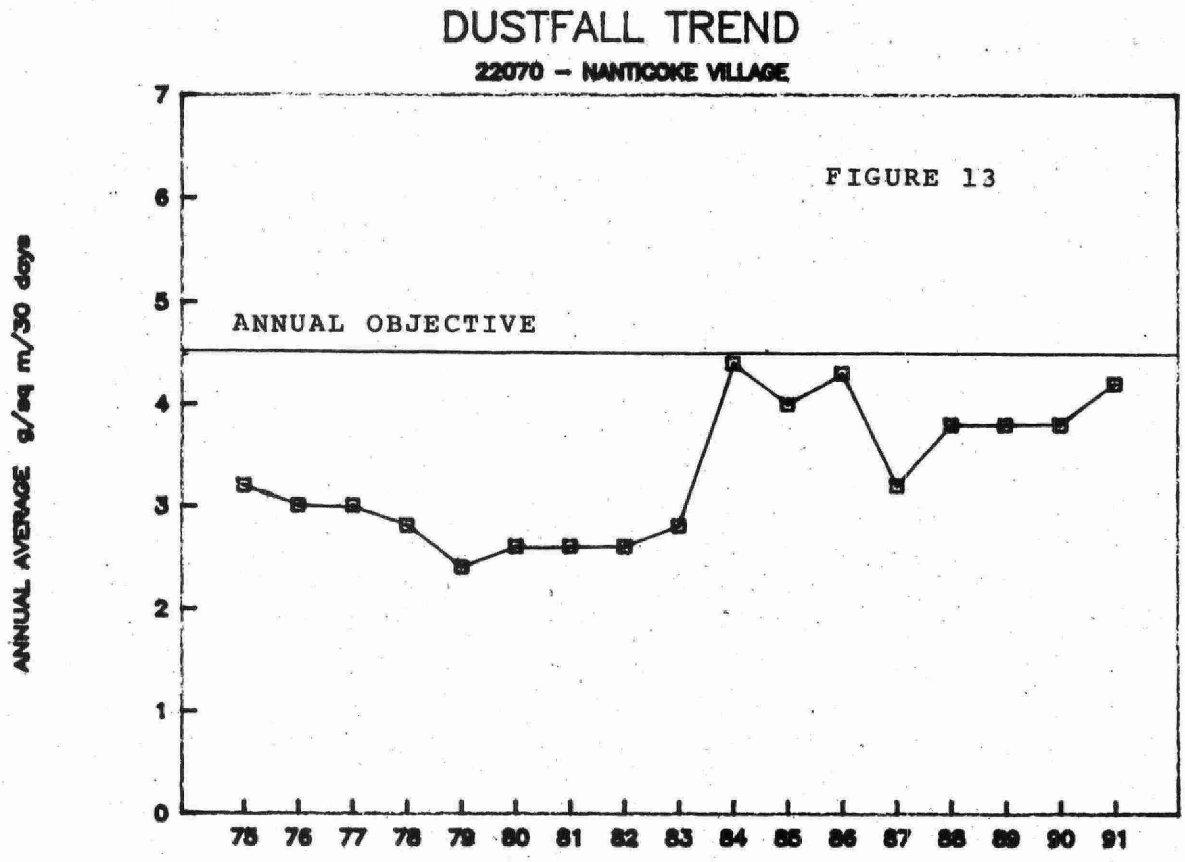
Two dustfall jars were located near the Ontario Hydro flyash lagoon area. The monthly objective was not exceeded at either 22092 or 22093 which lies closest to the ash lagoon area. In fact, the objective has not been exceeded at either station since January 1987.

The control program at Ontario Hydro referred to earlier has been successful in reducing windblown flyash emissions, previously shown by the trend graph in Figure 11.

TABLE 9
DUSTFALL
UNITS - GRAMS/ SQUARE METRE/30 DAYS

Ontario Objectives: 1-month - 7.0
1-year Average - 4.5

		Annual Average			Maximum 1991 1 Month	# of Months Above Objective		
		1989	1990	1991		1989	1990	1991
22070	Nanticoke Village	3.8	3.8	4.2	5.6	0	1	0
22092	Rainham/Sandusk	1.7	1.8	1.7	3.6	0	0	0
22093	N.G.S. Flyash Area	2.3	2.7	3.1	6.1	0	0	0


DUSTFALL TREND
22070 - NANTICOKE VILLAGE
FIGURE 13
ANNUAL OBJECTIVE
ANNUAL AVERAGE g/sq m/30 days
0
1
2
3
4
5
6
7
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91

Fluoridation

This measurement is a relatively simple assessment used to determine quantities of fluoride compounds in the ambient air. A lime coated paper is exposed to the atmosphere for approximately 30 days and chemically analyzed for fluoride. The fluoride objectives are based on vegetation damage and for this reason, the objective is more stringent during the growing season. For the period of April 1 to October 31, it is 40 micrograms/100 cm^2/30 days while for the remainder of the year it is 80. A possible source of this contaminant is Stelco's basic oxygen furnace, although gas scrubbing removes most of the emissions.

Four stations surrounding Stelco property monitored fluoride and 1991 data are given in Table 10 together with a trend graph in Figure 14..

Concentrations improved significantly in 1990/91, falling almost 60% on average from 1989. Only one reading at a single station marginally exceeded the stringent growing season objective. Past levels were not a serious problem but the 1990/91 improvement did put an end to a trend toward increasing levels in recent years.

TABLE 10
FLUORIDATION RATE
UNITS - MICROGRAMS/ 100 CM^2/30 DAYS

Ontario Objectives: April 1 to October 31 - 40
November 1 to March 31 - 80

		Annual Average			Maximum 1991 1 Month	# of Months Above Objective		
		1989	1990	1991		1989	1990	1991
22057	Nanticoke Creek	42	14	16	28	3	1	0
22074	Imperial Oil	32	12	17	24	2	0	0
22083	Dogs Nest	31	11	13	28	1	0	0
22961	Nanticoke North	39	22	30	47	3	0	1

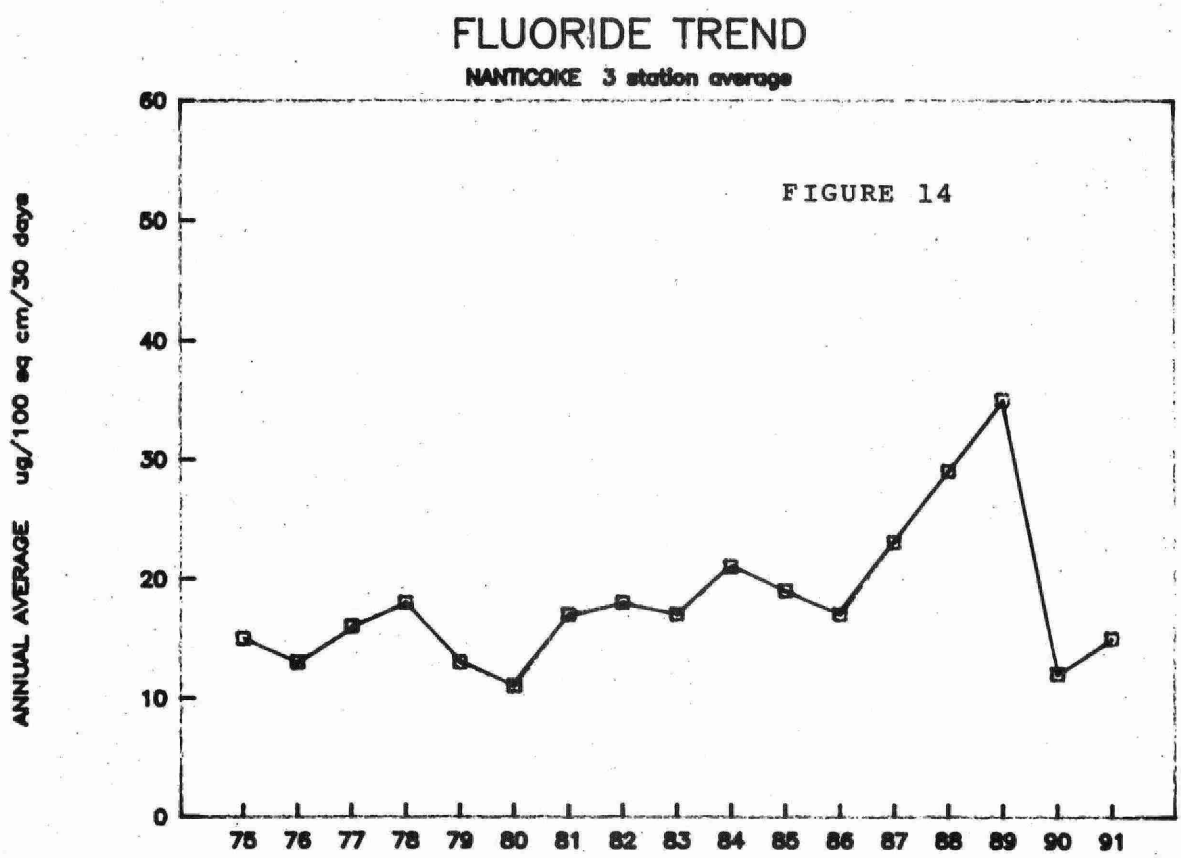

FLUORIDE TREND
NANTICOKE 3 station average
ANNUAL AVERAGE ug/100 sq cm/30 days
60
50
40
30
20
10
0
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91

FIGURE 14

DISCUSSION

Overall, 1991 data in the Nanticoke area revealed that air quality was very good and reflected a relatively minor impact by the main industries. Sulphurous odours near Stelco were the main item of concern.

Pollutants such as sulphur dioxide, oxides of nitrogen, and particulates showed quite low levels well within relevant objectives.

Total reduced sulphur (TRS) levels and related odour problems within Nanticoke Village continued to be a problem in 1991. Slag quenching is one of the main sources causing the odours. Changes in slag quenching schedules and practices were undertaken in 1991 leading to improvements. The company is also installing an odour control system at the coke oven area in 1992.

Sulphur dioxide (SO_2) normally recorded low measurements throughout the network of monitors. The Nanticoke Generating Station is the largest SO_2 source in the area but its effect on the Nanticoke area was fairly minor. Out of approximately 80,000 hours of monitoring, none exceeded the hourly objective.

Particulate levels in the region were quite low and generally showed acceptable concentrations. Fugitive dust emissions from the Stelco site were still occasionally a problem, particularly under high wind conditions in May. Close to Ontario Hydro property, distinct improvements in both suspended particulates and dustfall readings have been measured. A control program to control windblown flyash has been successful.

Fluoride levels around Stelco have improved significantly, ending a general trend toward increasing levels up to 1989.

Another pollutant of major concern is ozone, a product of long range transport. Ozone again routinely exceeded objectives during the summer

in Southern Ontario and appeared to arrive mostly from the United States. Levels measured at Long Point were among the highest recorded in the Province. Oxidant control will be required on an international and national rather than local scale. To this end, control programs in both the U.S. and Canada are being implemented to control volatile organic compounds (VOC) and nitrogen oxides (NOx) in order to resolve the ground level ozone problem by the year 2005.